REMARKS/ARGUMENTS

The Examiner objected to the drawings under 37 C.F.R. 1.83(a). More particularly, the Examiner argued that "the first supplying device" and "delivery means" (claims 1-14) must be clearly shown or the relevant features cancelled, and further argued that these two elements could be, respectively, the structures 22, 24 and/or 26, and either line 6 or recovered water line 12.

In reply, dealing first with the "delivery means", it should be noted that this is specified clearly in the claim as being for the delivery of "additional solvent", i.e. not for the delivery of the solution comprising the solvent and the chemical hydride. As such, this is intended to be a reference to the recovered water line 12. An amendment is being made to paragraph 30 to make this clear and to tie the claim language to the description of the water line 12.

With respect to the "first supplying device", a corresponding amendment is being made to paragraph 33, to make it clear that the elements 22, 24 and 26 together provide the supplying device. It is also being noted here that, depending upon the context, it will not necessarily be essential that all of these elements be present. At a minimum, it simply necessary that some element or elements be provided that function to supply the solution to the reactant.

Accordingly, it is submitted that these amendments clearly deal with the Examiner's objection and that the drawings are fully in compliance with 37 C.F.R. 1.83(a) as they stand. No new matter has been added.

The Examiner further objected to the drawings under 37 C.F.R. 1.83(b)(4), on the grounds that the reference 14 has been used to denote two different elements. In response, the upper reference 14 in Figure 2 is being deleted.

The Examiner also correctly noted that the reference 26 had been used twice in Figure 2. The upper reference 26 is being changed to 27, and a corresponding amendment is being entered to the second line of paragraph 40, to refer to a "filter 27". Accordingly, it is submitted that this amendment brings the drawings into full compliance with the rules, and again no new matter has been added.

With respect to the abstract, the Examiner, again, correctly noted that legal phraseology such as "means" and "said" had been used in the abstract. A revised abstract is being submitted to avoid such legal phraseology.

The Examiner then noted a number of minor inconsistencies in the disclosure. Various amendments are being entered as detailed above, all of which essentially incorporate the Examiner's suggestions. The first line on page 11 has been amended slightly differently, but with the same intent as the Examiner's suggested amendment.

Turning to the claims objections, the Examiner drew attention to various informalities in claims 1, 3, 12 and 14. The amendments suggested by the Examiner are being introduced.

Various other claims were rejected under the nonstatutory double patenting rejection, in view of U.S. Patent 6,727,012, U.S. Patent 6,737,184 and published application 09/986,636, this latter rejection being a provisional obviousness-type double patenting rejection as the claims have not in fact been patented. In response, please find enclosed terminal disclaimers for the two issued patents and the pending application.

Claims 1-15 stand rejected under 35 U.S.C. 112, second paragraph as being indefinite. Again, the Examiner had difficulty with the terms "the first supplying device" and "delivery means", corresponding to the objections to drawings above. It is submitted that in view of the explanation given above and the amendments being entered, these terms are entirely clear, and that no further amendment is necessary in this respect.

The Examiner then rejected the claims under 35 U.S.C. 102 as being anticipated by Nakanishi et al. This rejection is respectively traversed, for the reasons detailed below.

Nakanishi is concerned with a fundamentally different type of system.

The Examiner argued that Nakanishi et al. discloses a storage means 21 for storing one of a plurality of metal hydride, including borohydrides. While Nakanishi et al. may be indeed concerned with a chemical hydride generation system (and there

are other disclosures in this art of the basic technique for hydrogen generation from chemical hydrides), it is noteworthy that the element 21 is defined as a "storage 21 for storing a bulk of a metal hydride...". See, for example, column 4, line 34-38, and also column 4, lines 48-55. There, it is made clear that the intention is to store the metal hydride as a dry powder. The disclosed structure then specifically provides a so-called "powdering mechanism 22" for reducing the bulk of the metal hydride into the form of a powder; as an alternative, it is noted that it is also practicable "to store a pre-powdered metal hydride" (column 4, line 53). Moreover, one can note numerous references to the alternative of generating hydrogen by pyrolysis, which is mentioned in numerous places, for example, column 2, line 25. Clearly, where the hydrogen is to be liberated from the metal hydride by pyrolysis, the use of a solution is completely impractical and would simple result in wasted heat, and indeed is clearly not taught by this reference.

Moreover, the teaching in Nakanishi et al. is that, even in the case of hydrogen generation by hydrolysis, the product of the reaction is stored in a separate location indicated as "product 24" (column 5, line 27). Thus, the product 24 accumulates at the bottom of the reactor 23.

As such, there is clearly no teaching of any recirculation technique. A necessary corollary is that this proposal does not have to deal with the problem of build up of the product in a solution, and whether or not the product is maintained in solution of is deposited as a precipitate. Indeed, it seems that the clear intent is that it would be deposited as a precipitate. As such, there is clearly no need for the inventors in Nakanishi et al. to consider the problem of maintaining the product in solution.

In contrast, the present invention is concerned with a wholly different technique, which relies fundamentally on circulation of a chemical hydride solution, which maintains remaining chemical hydride in solution and also in solution the product of the reaction. Thus, the concept of separate locations for the chemical hydride and the product is simply not present in the present invention. As a consequence, the present invention had to address the problem of maintaining both the chemical hydride and the product of the reaction in solution to prevent a precipitate forming and, for example, clogging catalysts and the like. For example, the paragraph 29 of the present

specification discusses the problem of maintaining the product of the reaction, $NaBO_2$, in solution. This product is less soluble than the reactant $NaBH_4$, and is approximately only 20% soluble. Therefore, as noted in this paragraph, in conventional systems, this difficulty is overcome simply by providing an excess of the solvent, alternatively expressed as reducing the initial concentration of the hydride in solution. This reduces the achievable hydrogen storage density of the system.

The solution to this problem, in the present invention, is to start with a relatively high concentration of the hydride, and then as the hydride is consumed, continuously supply water to the solution, so as to prevent the $NaBO_2$ concentration reaching too high a level causing precipitation, etc. This water is provided by the product or reaction from the fuel cell. This effectively enables the initial hydride concentration, and hence achievable hydrogen storage density, to be increased.

Accordingly, it is submitted that, contrary to the Examiner's arguments, no such system is taught in the Nakanishi et al. reference.

Claim 1 of the present application has been amended solely to clarify the claim, and not for reasons of patentability. Claim 1 calls for a storage means "for storing a chemical hydride solution comprising a solution of chemical hydride solute in a solvent". It then has a supplying device for supplying the chemical hydride solution from the storage means to the reactor, so that a catalyst within the reactor causes the necessary reaction to generate hydrogen. If further requires a presence of "delivery means" for delivery additional solvent to the chemical hydride solution as the chemical hydride is consumed in use, with the necessary implication that the volume of the solvent increases.

No such arrangement is found in the Nakanishi et al. reference. Firstly, the chemical hydride is stored in solid form, not in solution. The chemical hydride is provided to the reactor, e.g. the passage at column 4, lines 48-55 even suggests use of a file to file off a solid block of the metal hydride to form a powder which, apparently, then simply drops into the reactant. Nakanishi et al. do not teach the provision of supply of any solvent to the storage for the chemical hydride; rather, water is supplied directly to the reactor, so as to form hydrogen and the reaction product. Further, there is no

teaching of providing additional water to increase the volume of a solvent in a hydride solution.

Indeed, the teaching is apparently that just sufficient water is provided to generate hydrogen, in accordance with the standard reaction, given at column 1, line 37 of the reference, so that the hydrogen leaving the reactor is essentially dry. Note the proposal in Figure 8 to provide separate steam humidification of the hydrogen stream.

Accordingly, it is submitted that claim 1 and its dependent claims are all both novel and inventive over this reference.

A further significant aspect of the present invention is a provision of a return line for the solution between the storage means and the reactor. This return line then provides a complete fluid circuit, enabling continuous circulation of the circulation of the solution between the storage means and the reactor. Such an arrangement is even further removed from the teaching of Nakanishi et al. To better emphasis this aspect of the present invention, claim 14, directed to this feature, has been put into independent form. It effectively incorporates the subject matter of former claims 1 and 14.

With respect to claims 17-23, these have been retained, revised to refer to "a chemical hydride hydrogen generation system" and also amended to include revisions to claim dependencies. Additionally, these claims have been revised so as to make it clear that the fuel cell is not part of the claimed system, but rather that the relevant elements and features introduced in these claims, are merely "for use" with a fuel cell. As such, it is submitted that these claims can be properly retained as dependent from claims 1-15 elected for examination.

The Examiner had stated that a recitation of the intended use of a claimed invention must result in a structural difference between the claimed invention and prior art, to make it patentably distinct. Further, the Examiner cited *In re Casey* and *In re Otto* for support of the argument that, if the prior art structure is capable of performing the intended use, then it meets the claimed structure.

As detailed above, it is submitted that the prior art does not, in any sense, meet the claim structure, nor is it in any sense capable of performing the intended use.

To repeat, the reference does not provide a solution of the chemical hydride, and provides no means for displacing, e.g. by pumping, a solution from a storage means to reactor, or otherwise between different vessels within a system.

The Examiner further argued that the specific reactants, e.g. freezing point depressing agents, alkaline additives, etc., are merely directed to a manner of operating a chemical hydride hydrogen generation system. It is submitted that this remark and argument again fails to show the Examiner's appreciation of the distinctions between the present invention and the cited art. As in the cited reference, the hydride is stored in dry form and the product is essentially in dry form, there is never and necessity to consider handling a solution, pumping a solution, etc. The problems of dealing with a solution of a chemical hydride simply do not arise in the cited reference. The cited reference does make reference to use of such a system in a vehicle, yet fails to address the problem that many vehicles can be operated in environments where temperatures frequently fall well below freezing. In contrast, the present invention both identifies this problem and provides a solution, namely providing freezing point depressing agents, etc. Accordingly, it is submitted that these features amount to more than the manner of operating the system.

The Examiner further noted that intended use limitations, such as "for storing/supplying a chemical hydride solution" do not have patentable weight in an apparatus claim. To clarify this point, dependent claims 2, 3, 5-7 and 11 have been amended to make it clear that the chemical hydride solution is part of the claimed structure, to contrast with claim 1 where the storage means is "for storing a chemical hydride solution". In these claims, and their dependent claims, the actual composition of the chemical hydride solution is specified, and it is now made clear that this does form part of the claimed structure.

Accordingly, it is submitted that the claims as they now stand are novel, inventive and allowable, and early review and allowance are requested.

Respectfully submitted,

BERESKIN & PARR

By _____

H. Samuel Frost
Reg. No. 31,696
Tel:416-957-1687

Attachments

Amendments to the Drawings:

The attached sheet of drawings includes changes to Fig. 2. This sheet, which includes Fig. 2, replaces the original sheet including Fig. 2.

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Annotated Sheet Showing Changes

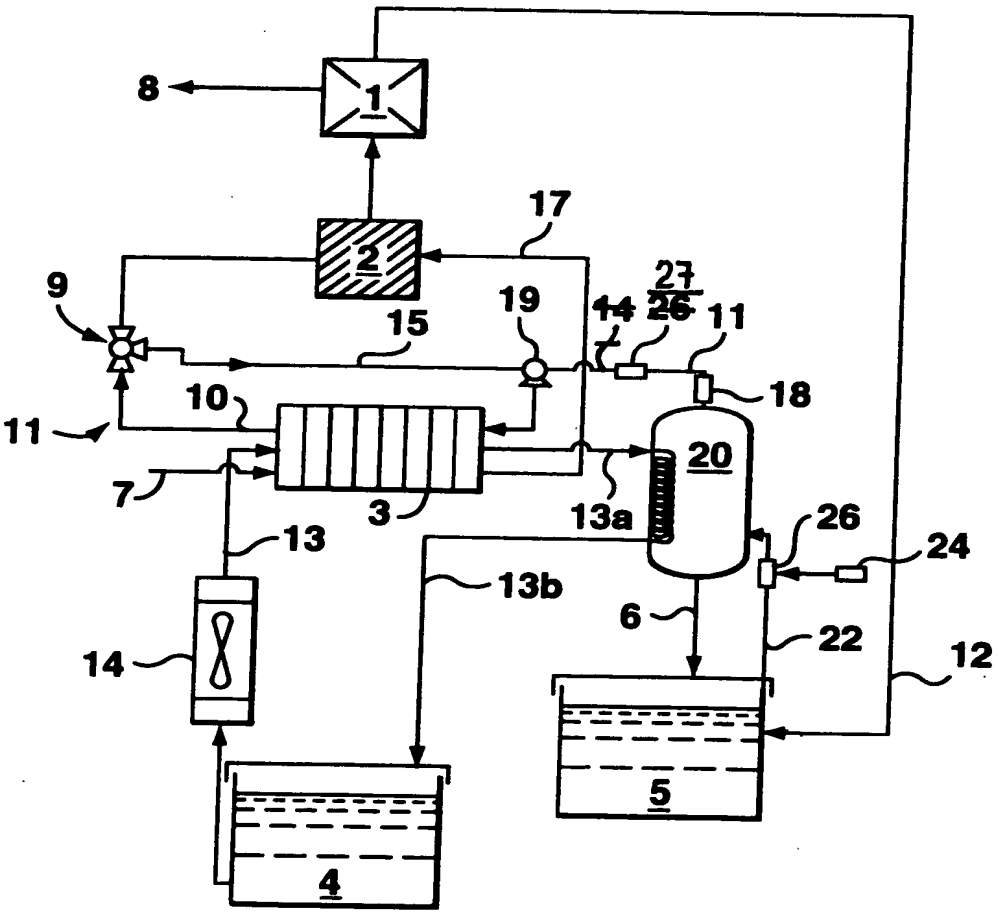

FIG. 2